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AO—66—2018

FACULTY OF ARTS/SCIENCE

B.A./B.Sc. (Third Year) (Sixth Semester) EXAMINATION

MARCH/APRIL, 2018

MATHEMATICS

Paper XVIII

[Mechanics-II (Dynamics)]

(Monday, 26-3-2018)   **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours*   *Maximum Marks*—40

N.B. :—   (*i*)   *All* questions are compulsory.

       (*ii*)   Figures to the right indicate full marks.

       (*iii*)   Use of non-scientific/non-programmable calculator is allowed.

1.   Attempt any *five* of the following :   2 each

    (*a*)   Define angular acceleration.

    (*b*)   Define curvature of the curve.

    (*c*)   Define kinetic energy.

    (*d*)   Write the units of impulse in M.K.S. and F.P.S. systems.

    (*e*)   Define projectile.

    (*f*)   Define highest point of trajectory.

2.   Attempt any *two* of the following :   5 each

    (*a*)   Find the expression for velocity and acceleration in terms of vector derivatives.

    (*b*)   Find the radial and transverse components of velocity.

                                                 P.T.O.

(*c*) A point moves in a curve so that its tangential and normal accelerations are equal and the tangent rotates with uniform angular velocity. Show that the intrinsic equation of path is of the sum $S = A. e^{\psi} + B$.

3. Attempt any *two* of the following : 5 each

(*a*) Prove that the principle of conservation of linear momentum.

(*b*) State and prove law of conservation of energy.

(*c*) A particle of mass *m* moving with velocity $\vec{v}$ picks up a mass M at rest. Find the velocity of the combined mass, the kinetic energy of the combined mass and the loss in K.E.

4. Attempt any *two* of the following : 5 each

(*a*) Find the velocity of a particle in terms of its height at that instant.

(*b*) Find the equations of a projectile to pass through a given point (h,k).

(*c*) When a particle is projected at an angle α with the horizontal, the horizontal range is R and greatest height is H, prove that :

$$\alpha = \tan^{-1}\left(\frac{4H}{R}\right).$$